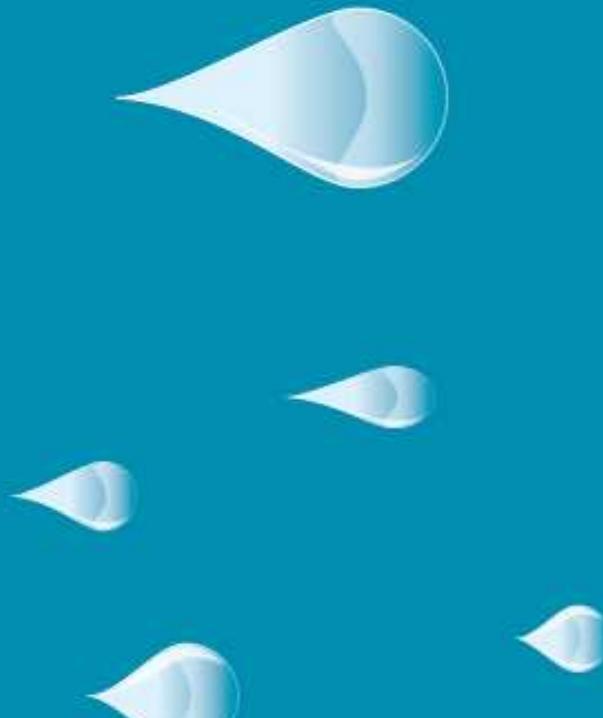
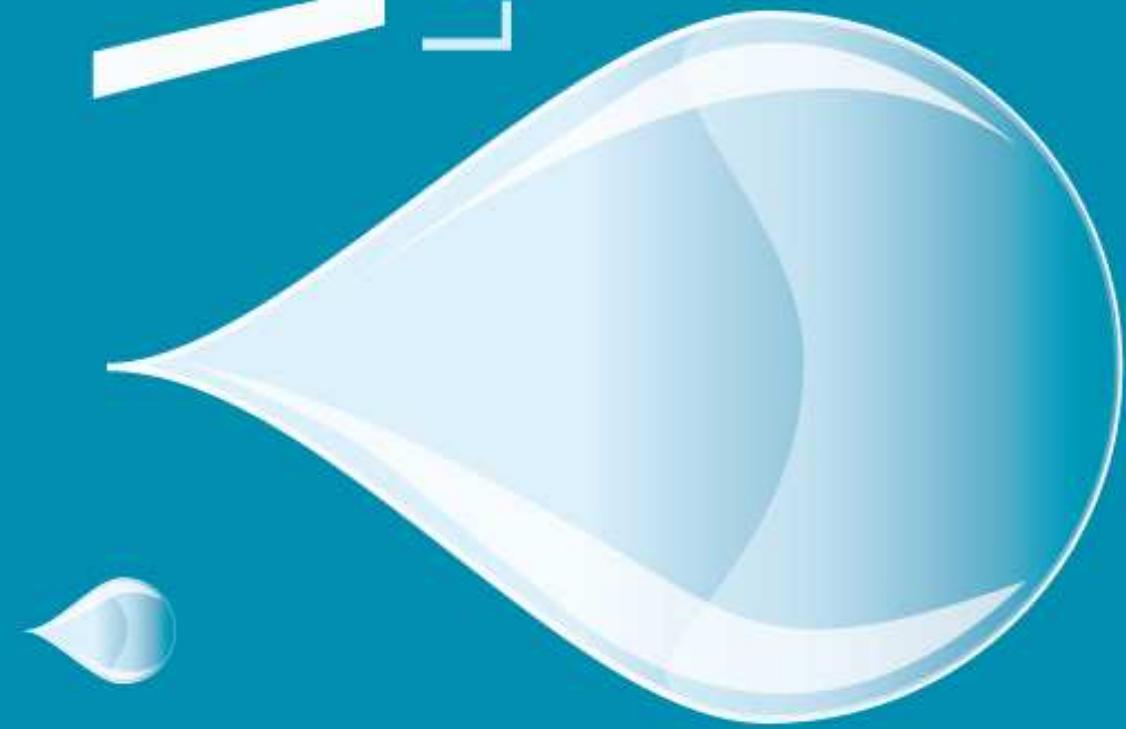


# Water

Love it or Hate it?



**What is yours is mine.**

# WATER

---

- Drought – Bring on the rain
- NPDES – Its not my H<sub>2</sub>O
- Research – EC & PSI
- Metrics – Dashboard

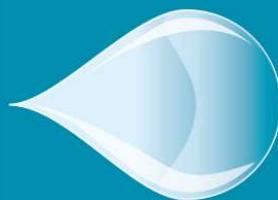
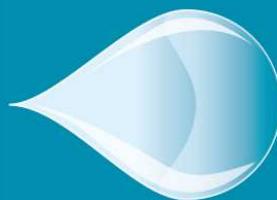
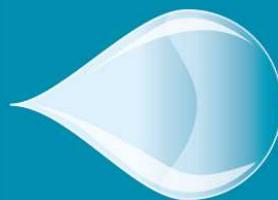
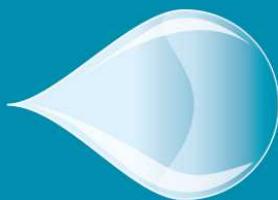
NCDOT Compliance

Annual Report

- Future Opportunities

River Keepers

Green Highways

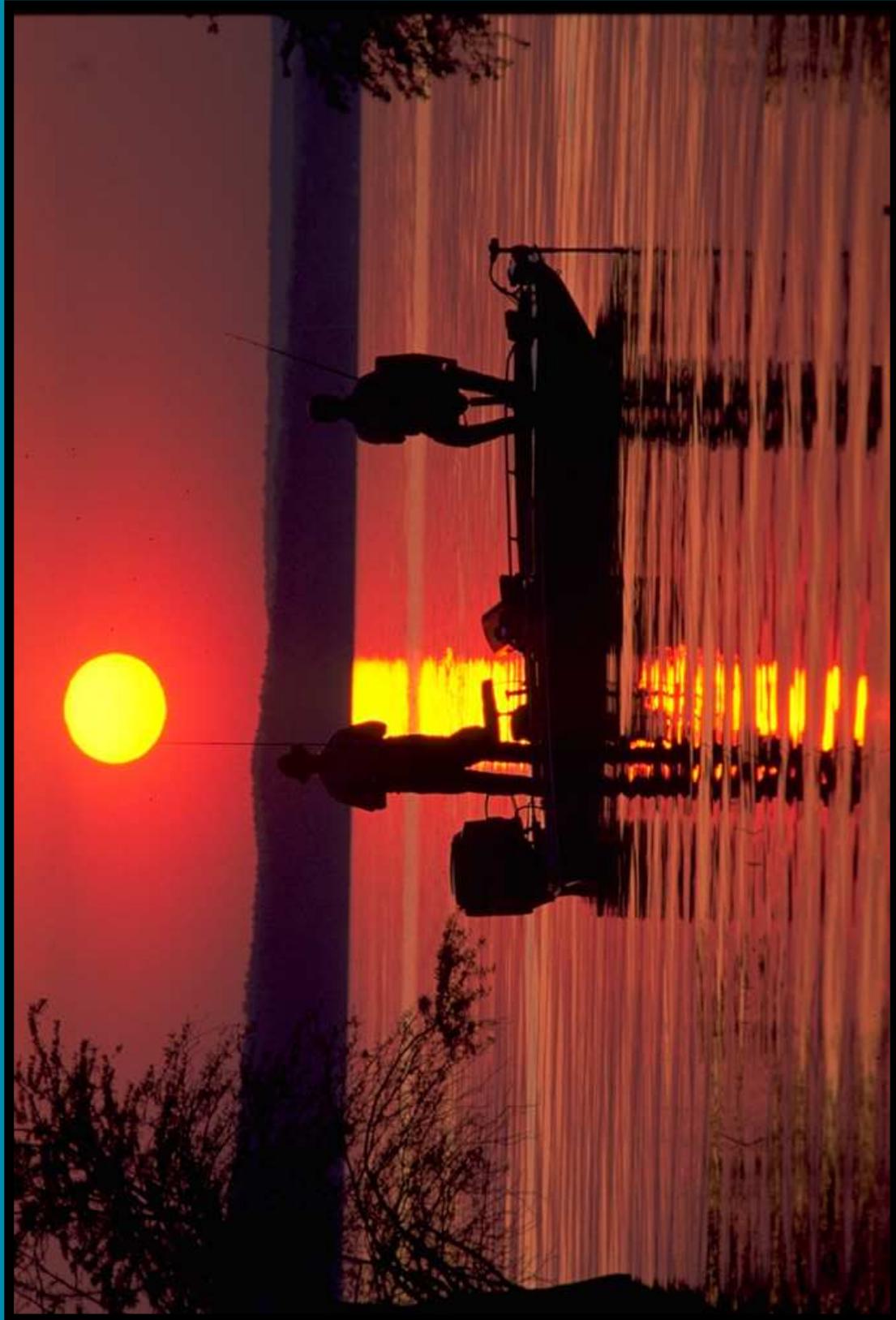


# WATER



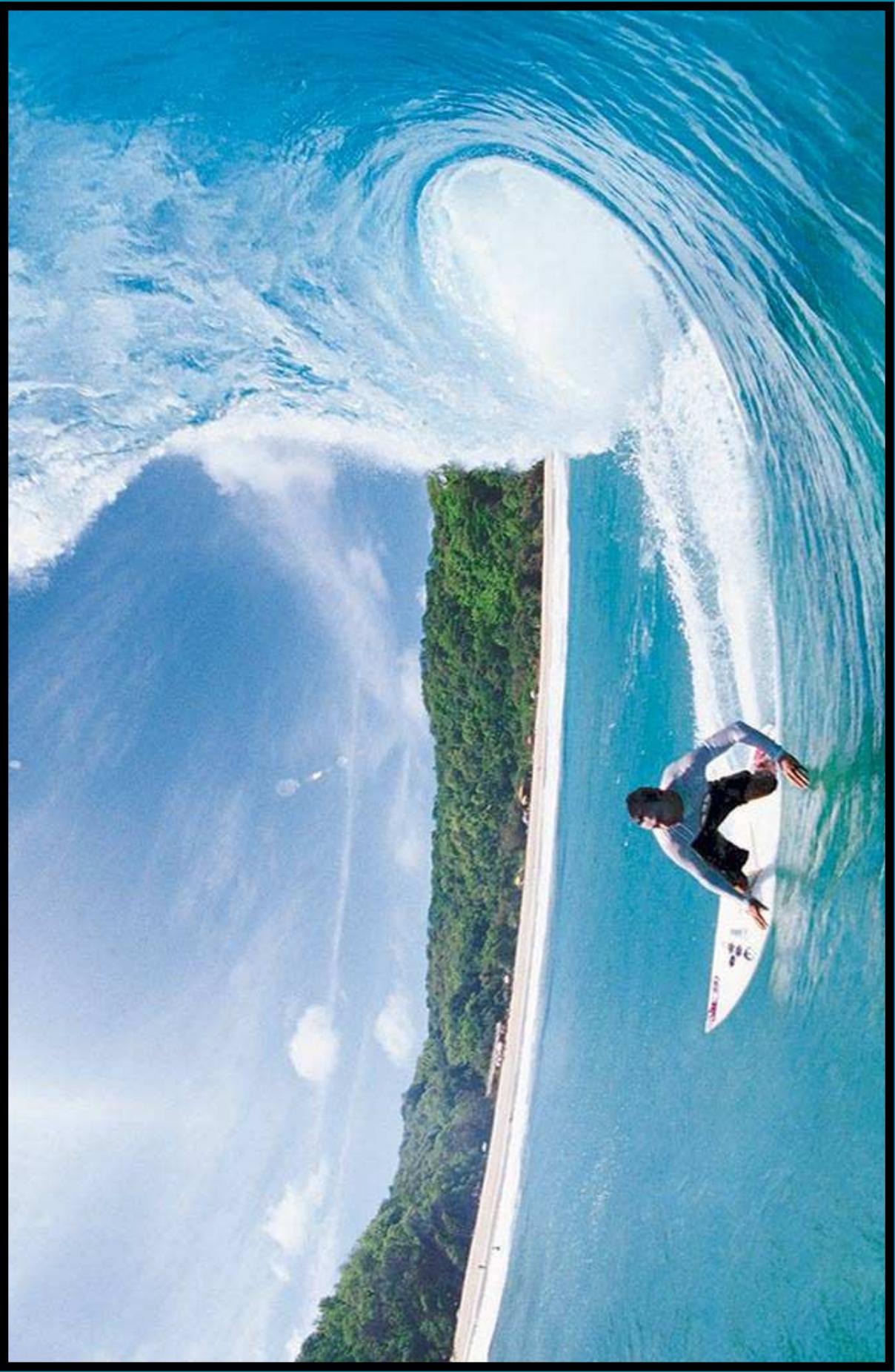
- Drought – **What is yours is mine**
  - NPDES – **What is mine is yours**
  - Research – EC & PSI
  - Metrics – Dashboard
  - NCDOT Compliance Annual Report
  - Future Opportunities
- What's  
mine is  
mine.
- What's  
yours is  
ours.

**Water, the good, the bad, and the ugly**

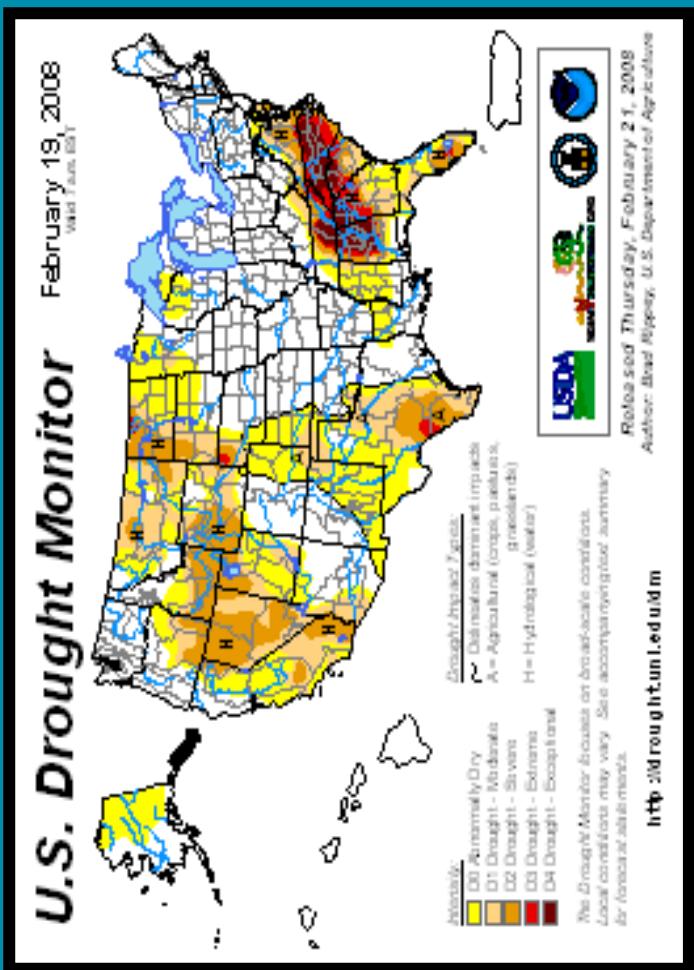


Good Water

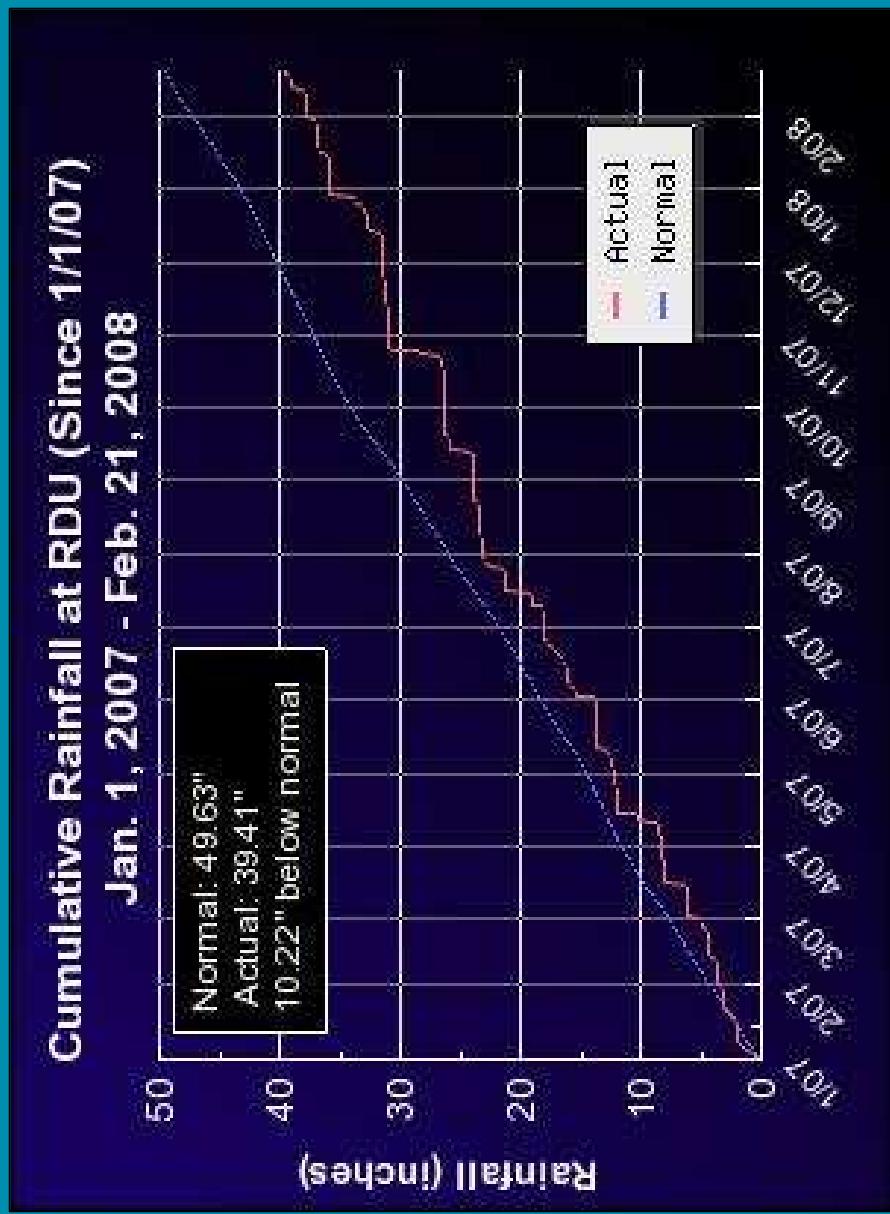
Good Water



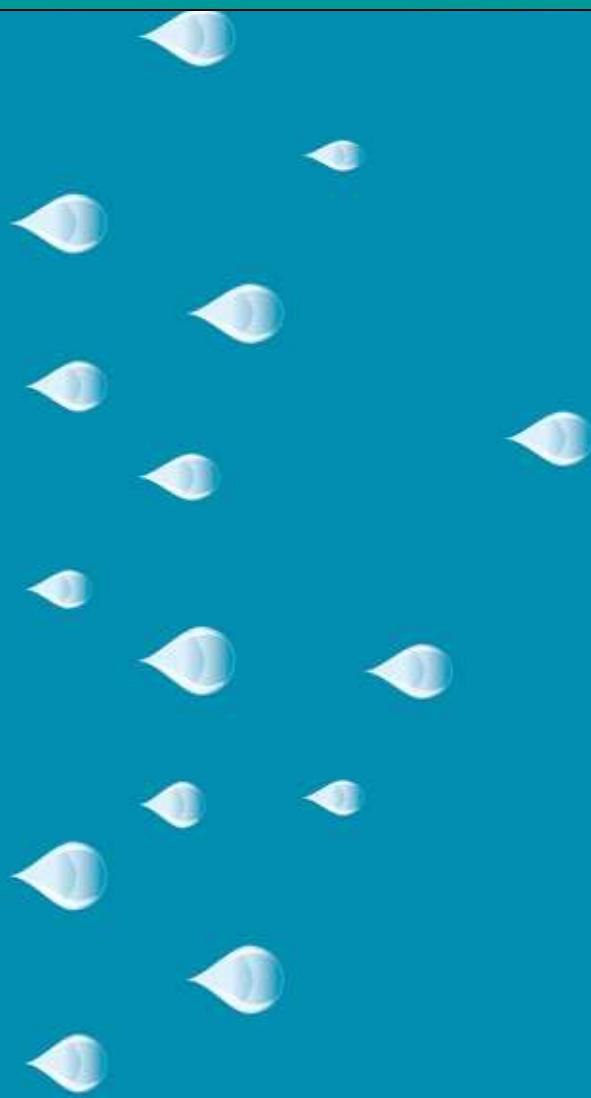
# Bad Water



# Drought – Bring it On!



# NPDES – Its not my H<sub>2</sub>O





07/28/2005



# Bad Water





# NCDOT Stormwater Management

- Why is Stormwater Important?
- Pollutants Associated with Stormwater
- Stormwater and TMDLs.
- NCDOT's Approach to Stormwater Management.
- Considerations for Construction

# NCDOT Research Vegetative Pollutant Removal



- Monitor roadside vegetation cover for their removal of pollutants
- Determine the nutrient loading rates from secondary roads
- Found not to overlook the potential pollutant removal by roadside vegetation
- Lead Researcher:

Dr. Jy Wu  
UNC-Charlotte  
Civil Engineering Department

# NCDOT Research

## Linear Wetland Performance

- Monitor linear swales along eastern North Carolina right-of-ways
  - Determine how effective these wetland swales are in removing pollutants
  - Examine unaltered swales and ones that are establishing wetland conditions



- Lead Researcher:  
Dr. William Hunt  
N.C. State Univ.  
Biological & Agri  
Engineering Dep

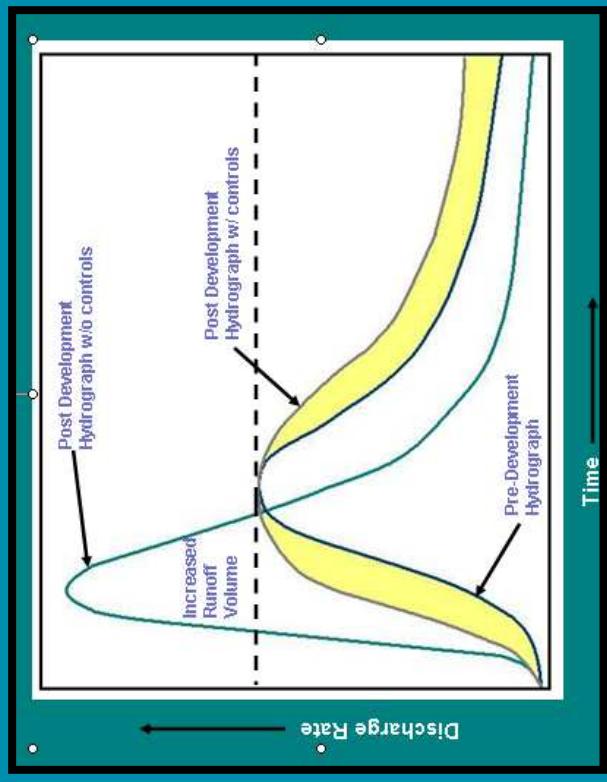


## Why Is Stormwater So Important to NCDOT?

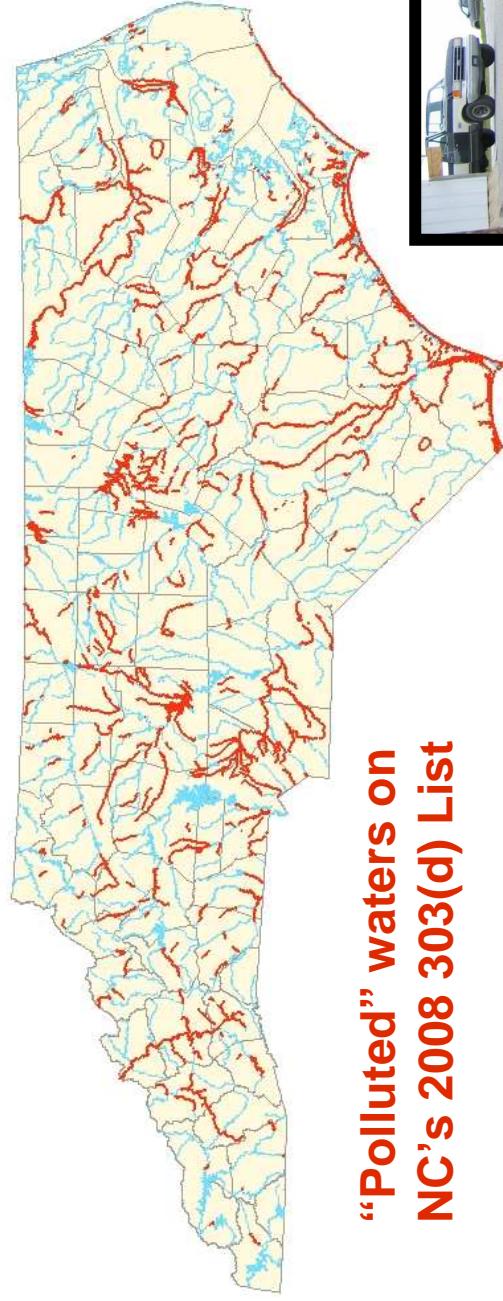
- The pollution associated with stormwater runoff is the number one water quality concern in North Carolina. – DWQ
- More Stormwater Regulations are being written due to impaired waters.
- North Carolina continues to develop, which will result in more roads and increased concerns regarding highway stormwater runoff.

# Pollutants of Concern:

- Hydromodification
  - Pre vs. Post Discharges
- Metals
  - Pb, Zn, Cu, Cd
- Bacteria
  - Fecal Coliform
- Solids
  - TSS, Settleable Solids
- Nutrients
  - Nitrogen
  - Phosphorus



# Stormwater and TMDLs

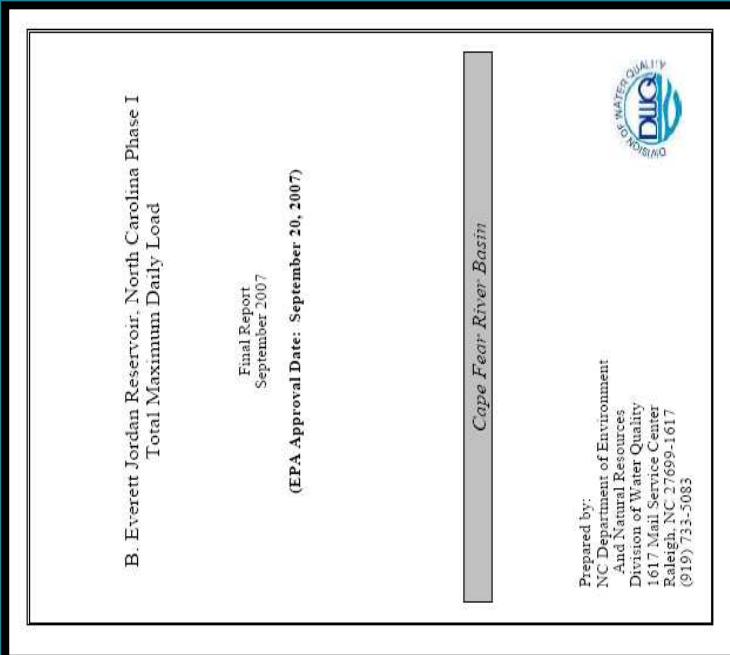


Untreated stormwater is  
a leading cause of water  
quality pollution in NC

# Approx. 50 TMDL Reports Have Been Published by NCDWQ

Final NC TMDLs					
Basin	Waterbody	Pollutant	Final TMDL	Approved	Number of Segments
Jordan	Jordan Lake	Total Phosphorus Total Nitrogen Fecal Coliform	Final TMDL Final TMDL Final TMDL	Sept. 20, 2007 May 17, 2002	
Little Troublesome Creek					
Town Branch		Fecal Coliform	Final TMDL	Sept. 16, 2002	
Northeast Creek		Fecal Coliform	Final TMDL	Sept. 12, 2003	
Robertson (Robeson) Creek		Total Phosphorus	Final TMDL	Jan. 13, 2004	
East Fork Deep River		Turbidity, Fecal Coliform	Final TMDL	Mar. 4, 2004	
Richland and Muddy Creeks		Fecal Coliform	Final TMDL	May 17, 2004	
North Buffalo Creek		Fecal Coliform	Final TMDL	Apr. 28, 2004	
Haw River, Deep River, and Third Fork Creek		Turbidity, Fecal Coliform	Final TMDL	Jan 11, 2005	
North Buffalo Creek	Cynamide		Contact MTU	Sept. 16, 1997	
South Buffalo Creek		Fluoride, Cyanide, Selenium	Contact MTU	Sept. 16, 1997	
Cotton Creek (From source to SR-1372		Cyanide, Nickel, Chromium, Lead, Total Residual Chlorine	Contact MTU	Sept. 16, 1997	
Cotton Creek (From SR-1372 to Cabin Creek)		Cyanide, Nickel, Chromium, Lead, Total Residual Chlorine	Contact MTU	Sept. 16, 1997	
Little Troublesome Creek		Cyanide, Lead, Cadmium, Total Chromium, Total Residual Chlorine, Fluorine', Methylen-Blue-Active-Substance (MBAS)	Contact MTU	Sept. 16, 1997	
Long Creek, McAlpine Creek, Little Sugar Creek, Irwin Creek, Henry Fork, and Mud Creek		Turbidity	Final TMDL	Feb. 8, 2005	
Clark Creek					
Irwin, Sugar, Little Sugar, McAlpine Creeks		Fecal Coliform	Final TMDL Appendices	Nov. 12, 2002 Mar. 28, 2002	
Crowders Creek		Fecal Coliform	Final TMDL	Jul. 1, 2004	
Lower Creek		Turbidity, chlorophyll-a	Final TMDL Contact MTU	Apr. 12, 2005 Feb. 5, 1996	
Lake Wylie					
Catawba Creek		Nutrients	Contact MTU	Feb. 5, 1996	

*Acrobat Reader software is required to read these documents.*





## NCDOT STORMWATER MANAGEMENT

Avoidance  
and  
Minimization  
Practices

Implementation  
of  
Stormwater  
Control  
Practices

Post-  
Construction  
Stormwater  
Management  
Practices

Continuous  
Process  
Improvement  
Practices

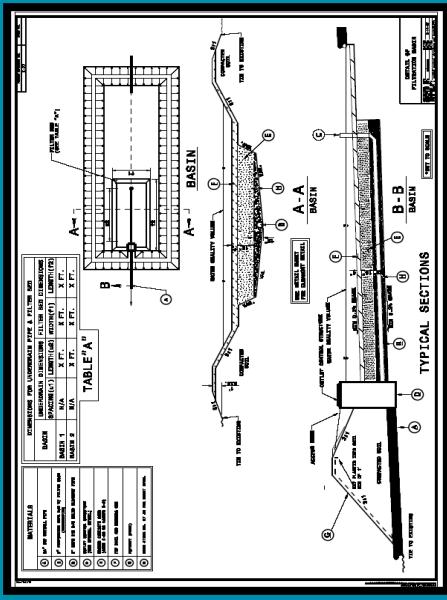
Environmental Programs  
Partnerships

NCDOT Business Units

Guiding Principles  
Regulations

# Stormwater Management and Construction

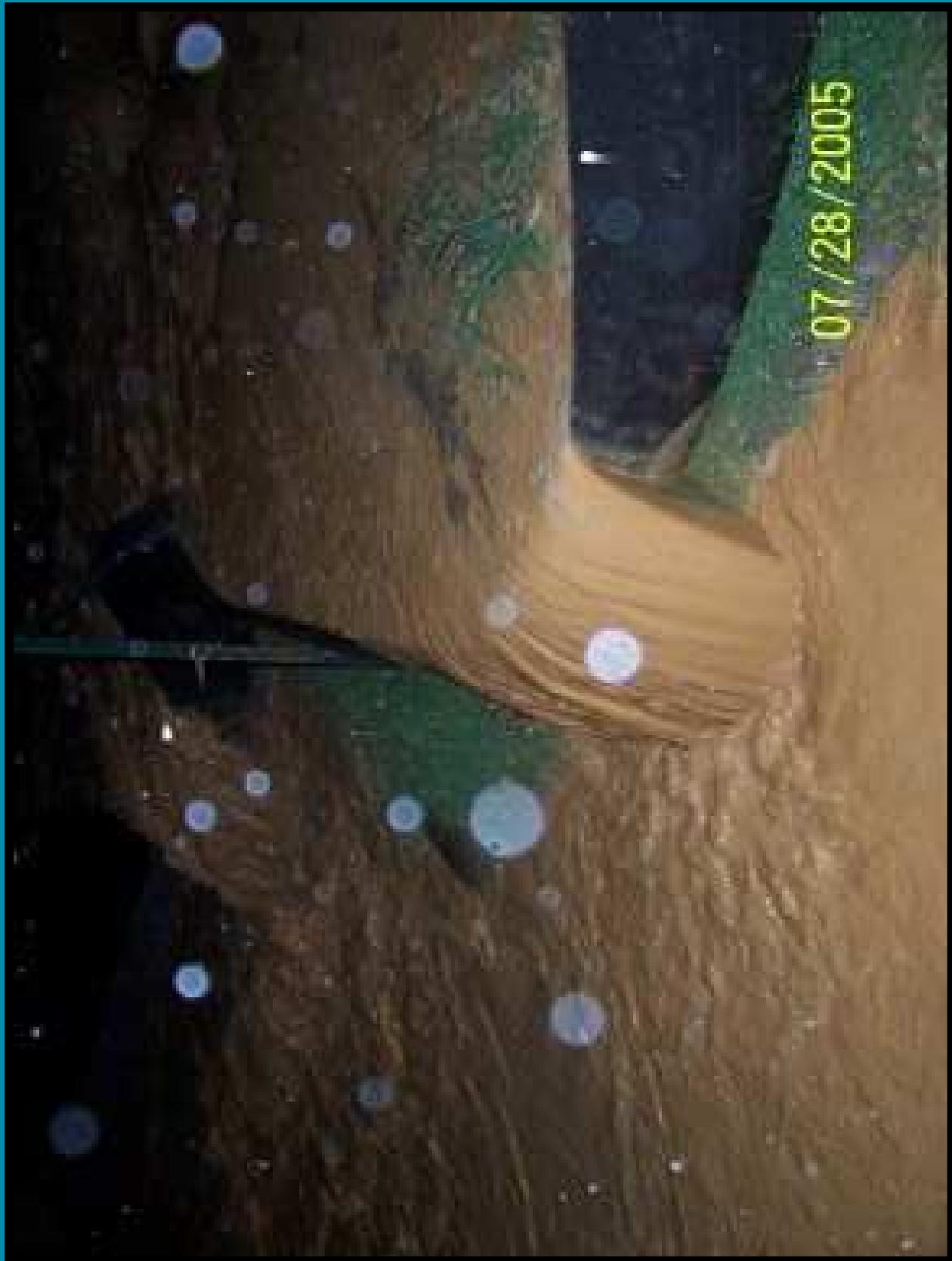
- More frequent use of sediment & erosion control practices for sensitive watersheds
  - More structural stormwater controls on projects
  - Construction sequencing and quality control especially important for these devises to function properly



# Erosion Control Regulations *vs.* Science *vs.* Practicality

The  
Key

07/28/2005



# Basins Sized Using The Surface Area Criteria

Innovation in Erosion Control

## Basins Sized Using The Surface Area Criteria

$SA = 0.01 \times \text{Peak Runoff}$   
Rate for a 10 Year Storm

Innovation in Erosion Control



# NCDOT Research Highway Sediment Export



- Monitor sediment export from road construction to a community lake
- Cooperate with local residents to help mitigate erosion issues
  - Pre-construction – 0.01 ton/ac-yr
  - Construction – 8.10 ton/ac-yr
  - Post- construction – 0.12 ton/ac-yr
  - General construction - 40.00 ton/ac-yr
- Lead Researcher:
  - Dan Line, PE
  - N.C. State University
  - Biological & Agricultural Engineering Department

# Sediment Control



Baffles

# Sediment Control

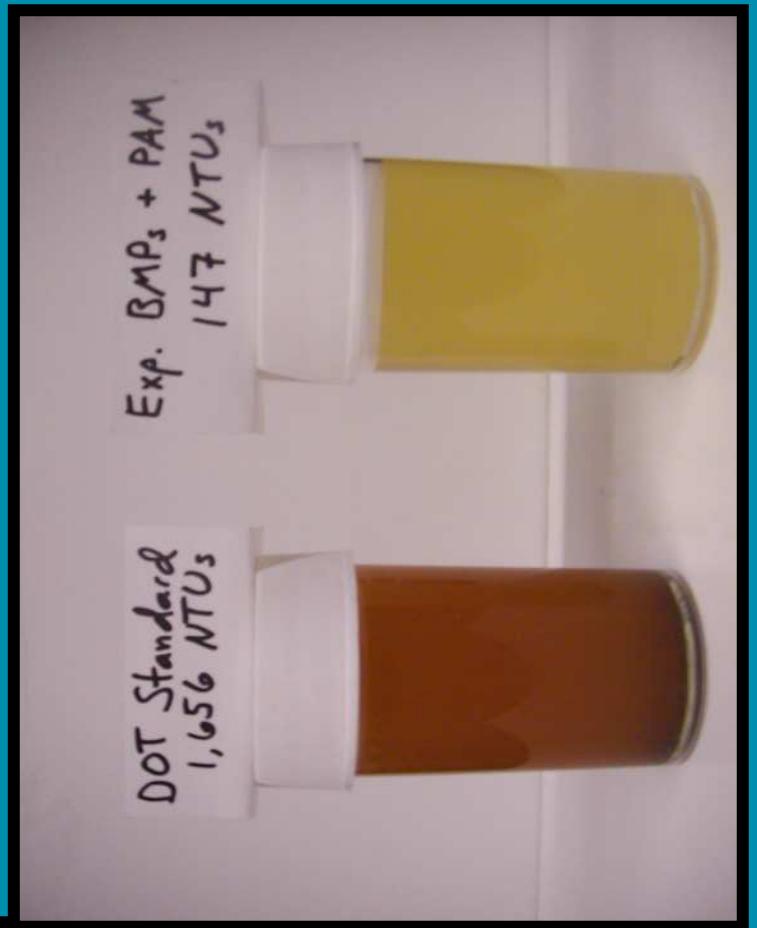


# Wattles with PAM

**Sprinkle 100 grams of PAM 705 on the lower, center portion of the wattle where water is going to flow over.**



# Very good previous results

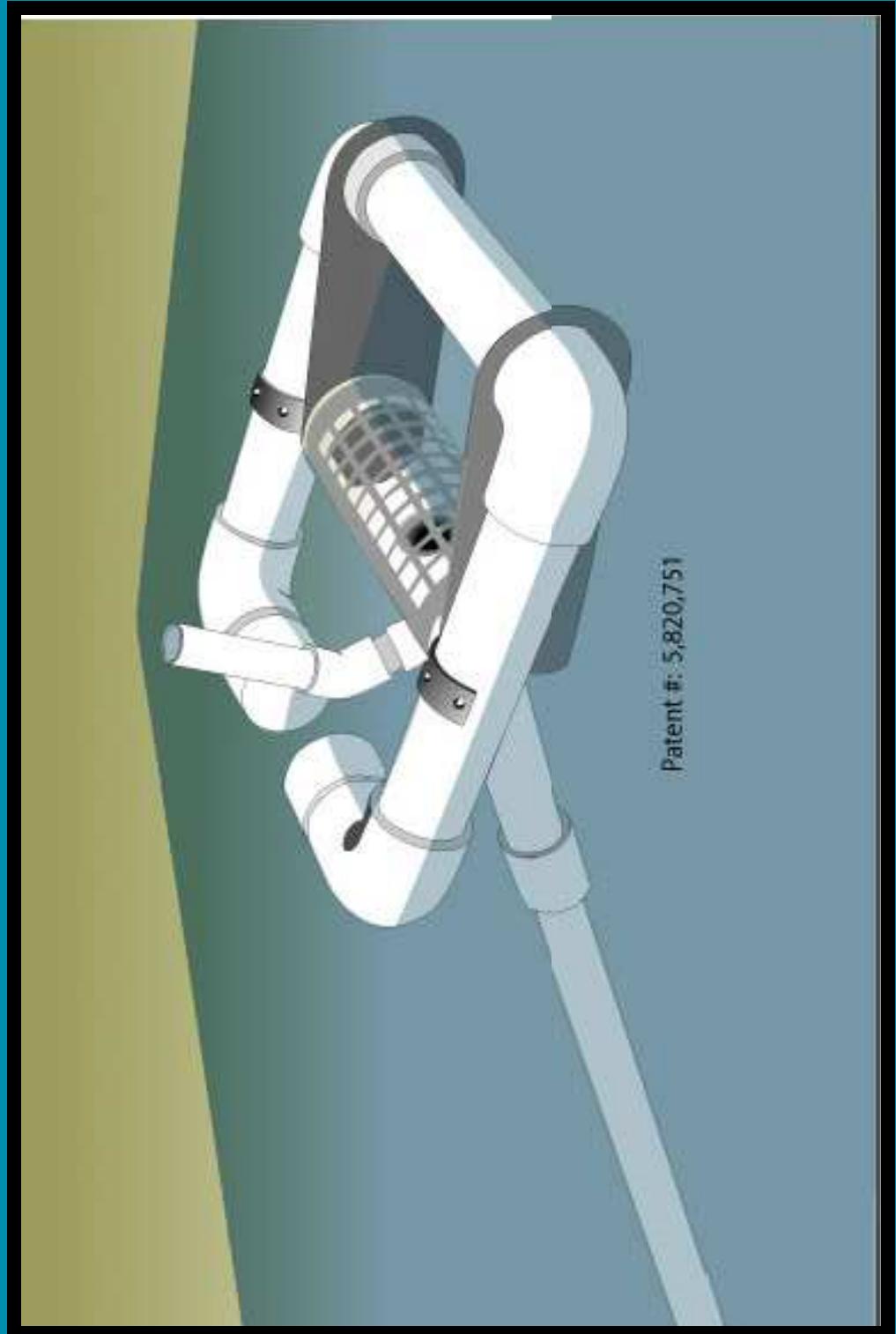


# For Turbidity Reduction

- When used with 100 grams of PAM applied to top of wattle prior to storm event, a NTU reduction is observed.
- Recommended for HQW, ORW, WS-I, WS-II, & Trout water designated areas.



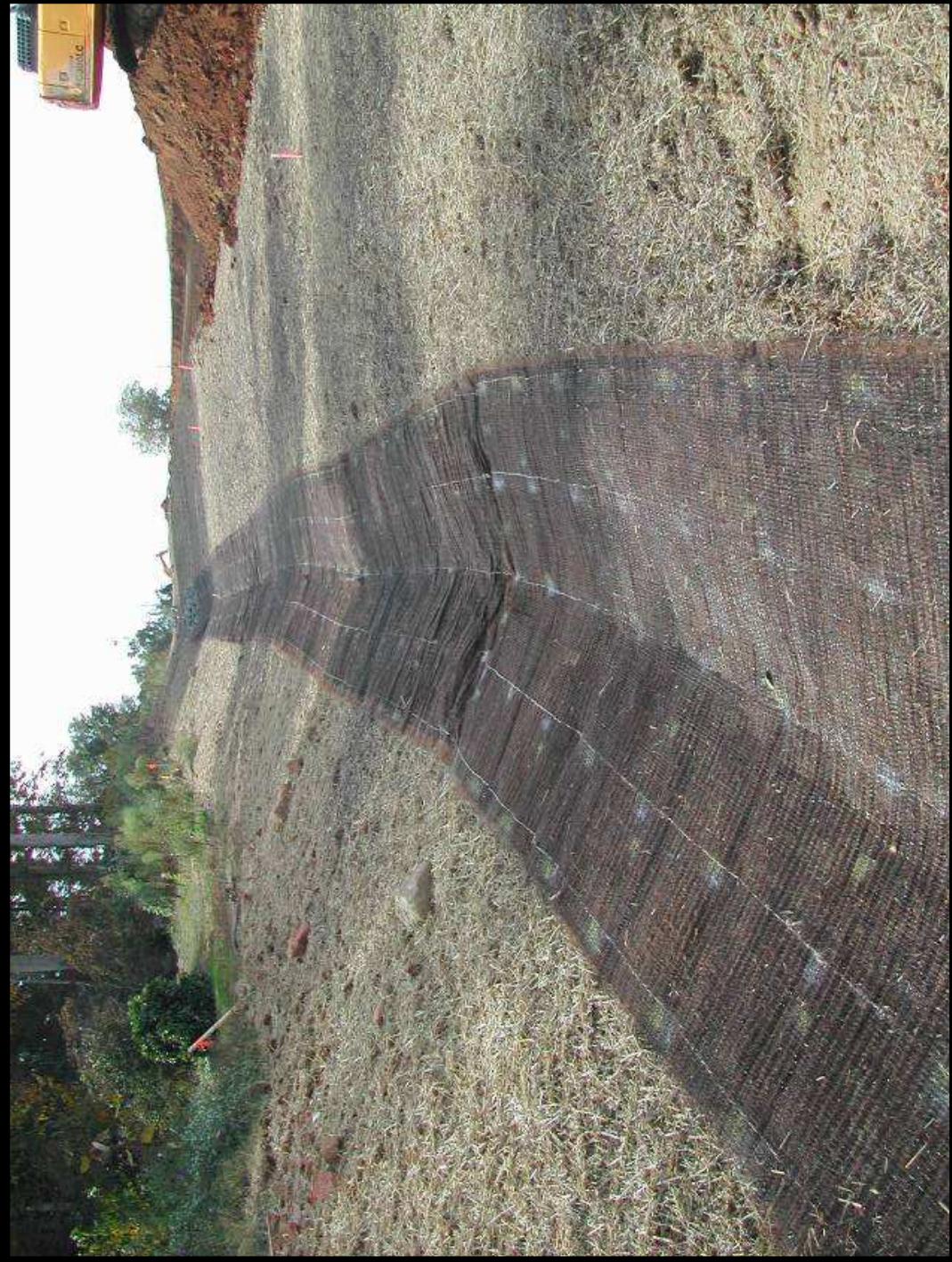
# Sediment Control



Patent #: 5,820,751

# Skimmer Outlet Devices

# Erosion Control



# Soil Reinforcement Matting

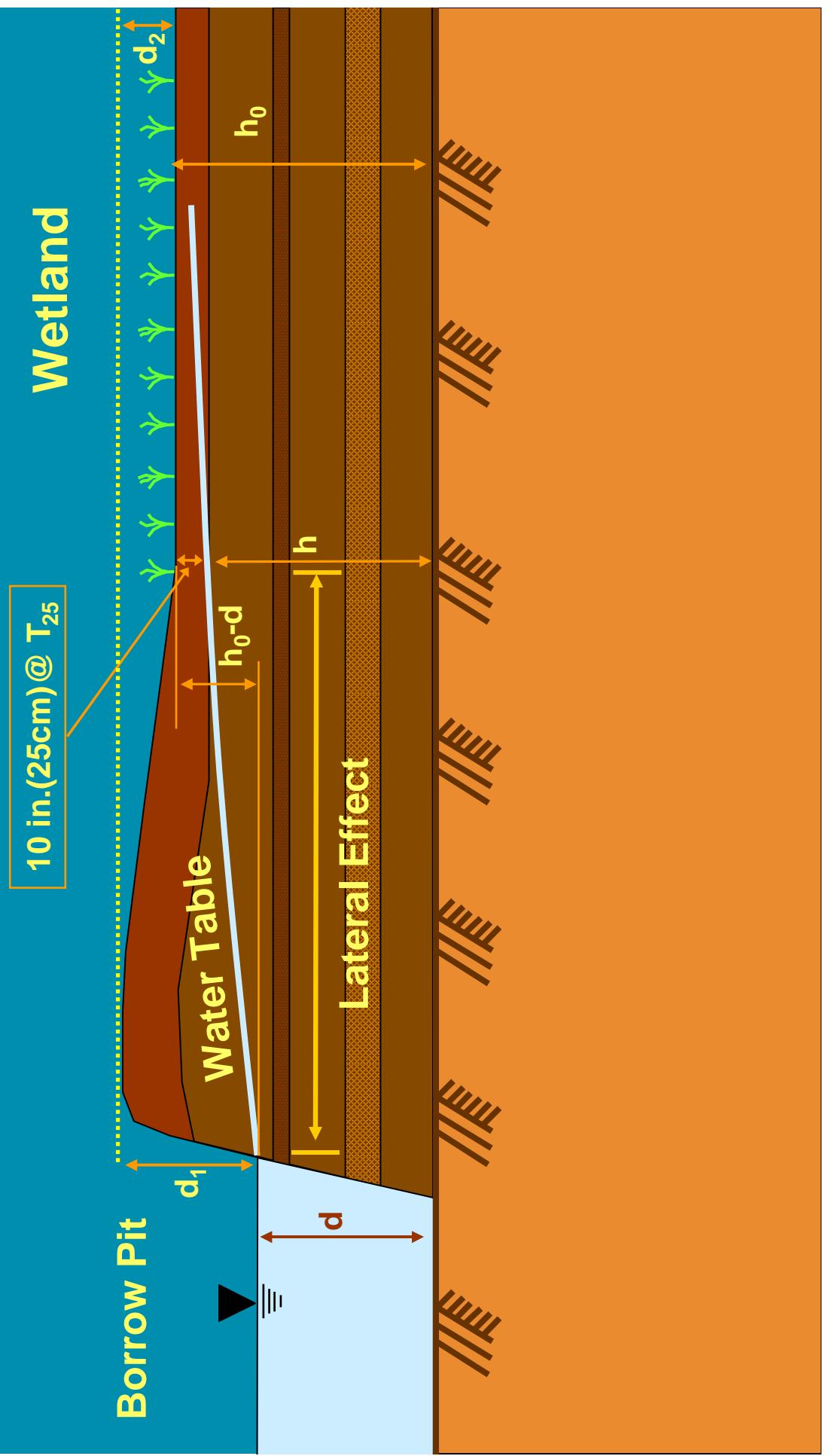
# Erosion Control



# Bonded Fiber Matrix

# Determination of Lateral Effects of Borrow Pits On Hydrology of Adjacent Wetlands

R. Wayne Skaggs, G.M. Chescheir, and Brian Phillips  
North Carolina State University



# SUMMARY

- Objective 1: Information developed to predict setback requirements
  - Computer model developed to automate process of calculating lateral impact (setback requirement)
  - $T_{25}$  values determined for all 100 counties

# SUMMARY

- Objective 2: Pits adjacent to wetlands can be classified as one of three types.
  - Type 1: Flow from wetland to pit
  - Type 2: Flow from pit to wetland
  - Type 3: Flow through pits, wetland to pit on one side, pit to wetland on other side.
- Setback calculation only required for Types 1 and 3.

# SUMMARY

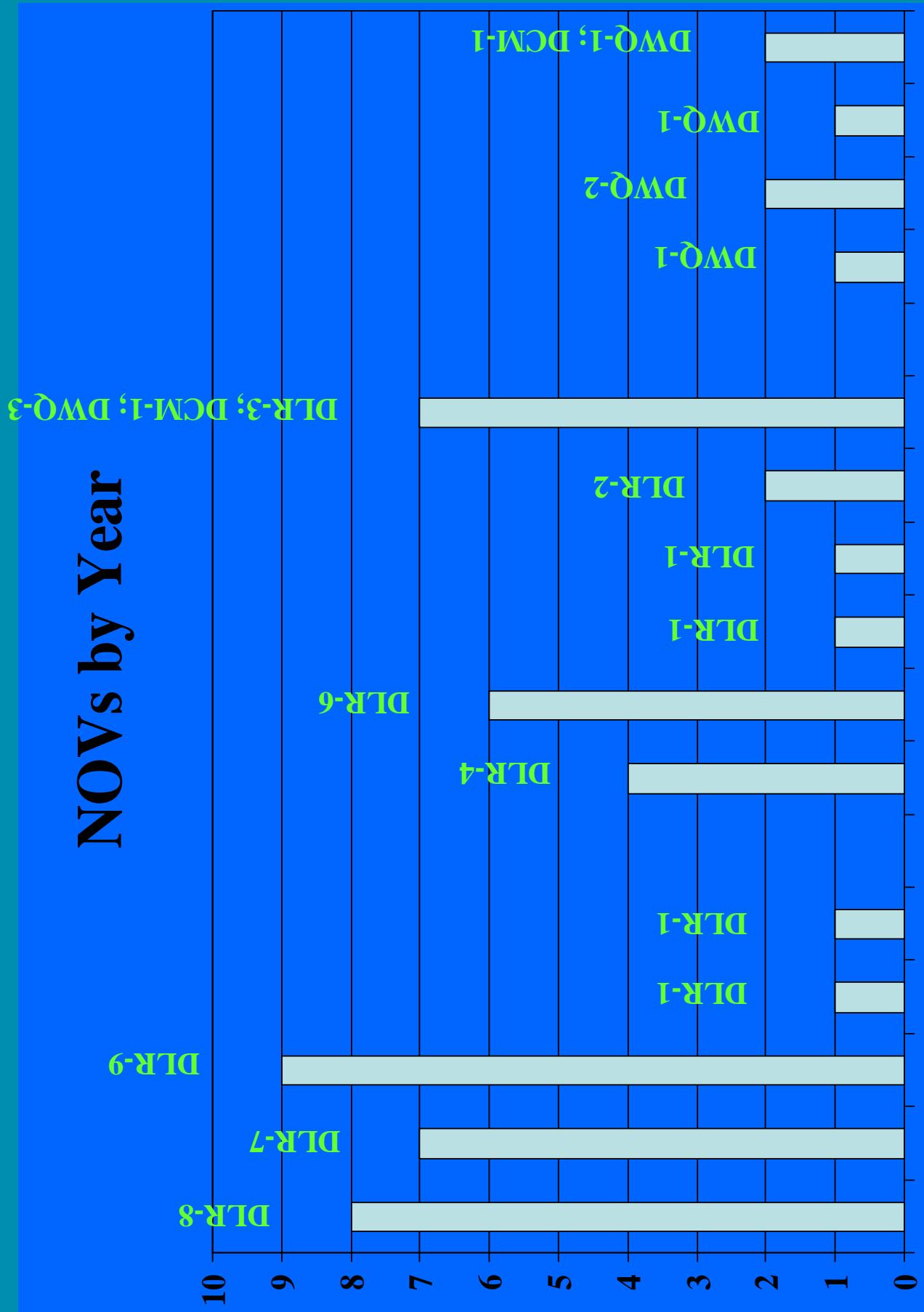
- Objective 3: Time required for pits to fill to equilibrium after closing varied from 10 to 23 months among 4 pits studied. The mean time to fill was 18 months.

# SUMMARY

- Objective 4: Equilibrium water level in the pit is dependent on outlet elevation, depth of adjacent drainage ditches, and related factors. Assumption of a 2' depth below wetland surface provided a conservative estimate of setback distance for sites analyzed in this study.

# Metrics – Dashboard





*Review of*  
*Erosion and Sedimentation Program*  
***Delegation to the North Carolina Department  
of Transportation, Division of Highways***

*February 20, 2008*

*Performed by:*

*T. Gray Hauser, Jr., P.E.*  
*State Sedimentation Specialist*

*Sonya Avant Tankersley, P.E.*  
*Assistant Sedimentation Specialist*

**NCDENR**

*North Carolina Department of Environment  
and Natural Resources*  
*Division of Land Resources*  
*Land Quality Section*

# Recommendations

- Inspection Reports used for weekly sedimentation and erosion control measures should be standardized and include location, needed action, date first reported, and date corrected. The NC DOT inspector and the Contractor should sign the reports. Records of rainfall data and other storm water monitoring data should be kept in a uniform manner.

# Recommendations

- Cotton Fiber mulch should be limited to applications when moisture and temperature are favorable for rapid establishment of vegetation.
- Diversions, traps and basins should not have vertical side slopes. Construction details and training should emphasize installation that allows stabilization of these measures with vegetation.

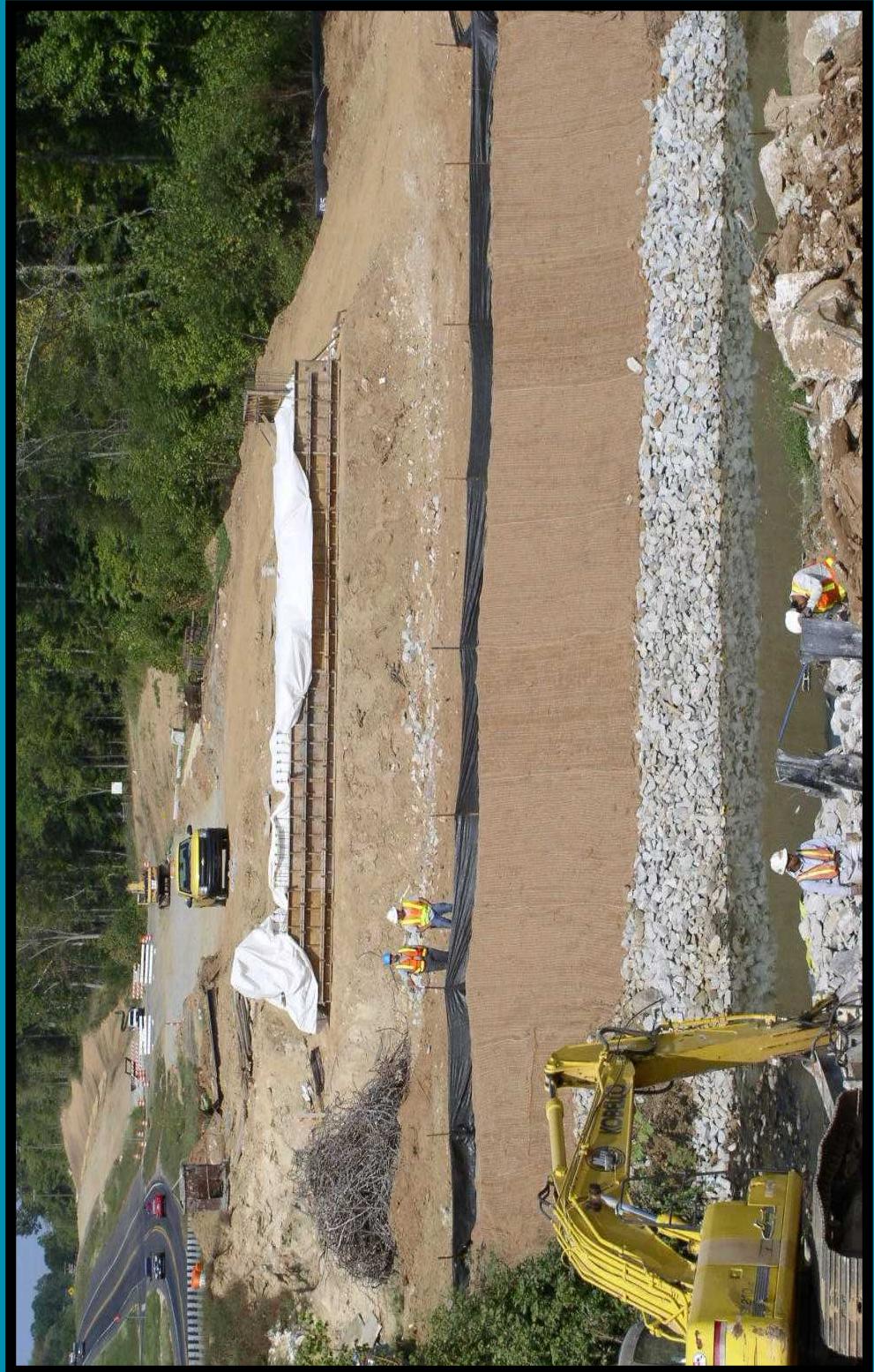
# Recommendations

- Enhanced sediment settling with flocculants should be integrated with traditional practices when adequate surface area cannot be provided for measures.
- Adequate sediment control for the clearing and grubbing of cut slopes in steep terrain should be provided.

# Recommendations

- Sediment control should be kept in place until ground cover sufficient to restrain erosion is established rather than being removed for the convenience of the seeding contractor.
- The inlet protection for slope drains should be designed for adequate sediment trapping and storage when the drain discharges without further sediment control.

# E&SC/Stormwater Certification 2007 - 2008



# Level 1 Certification Training



- Began in March 2006
- To Date, 836 Certified in Level 1 Installers/Inspectors
- Recertification Req'd Every 3 years

# Level 2 Certification Training

- Began in Feb. 2005
- To Date, 1878 Certified Level II Site Managers
- Recertification Req'd Beginning Feb. 2008



# Level 3 A/B Certification Training

- Began in Jan (III A) and Feb (III B) 2007
- 325 Level III A Designers Certified
- 288 Level III B Designers Certified
- Recertification to Begin Jan 2010

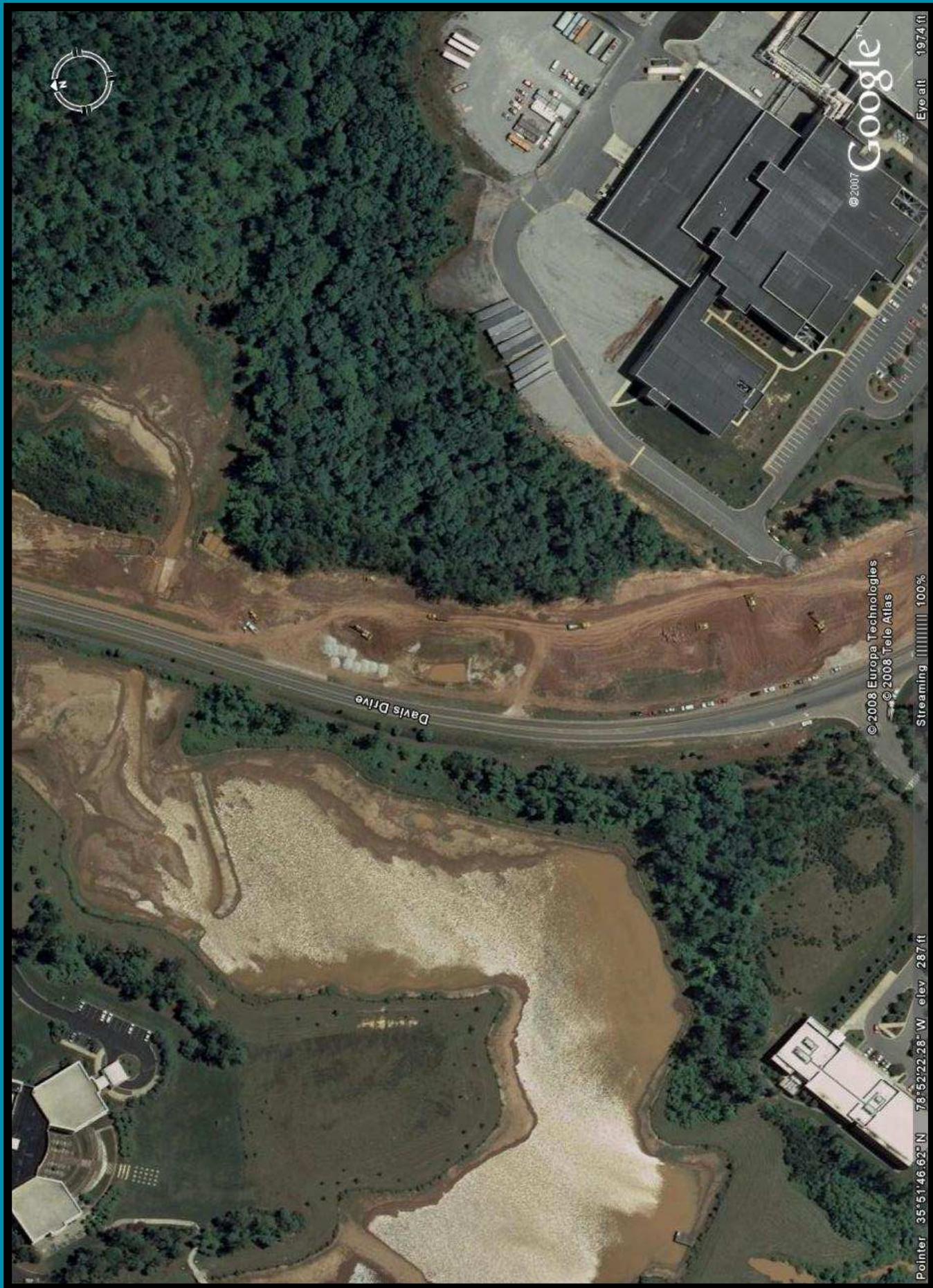


## Future Opportunities



- Green Highways
- River Keepers





Eye all 1974.11

Google™

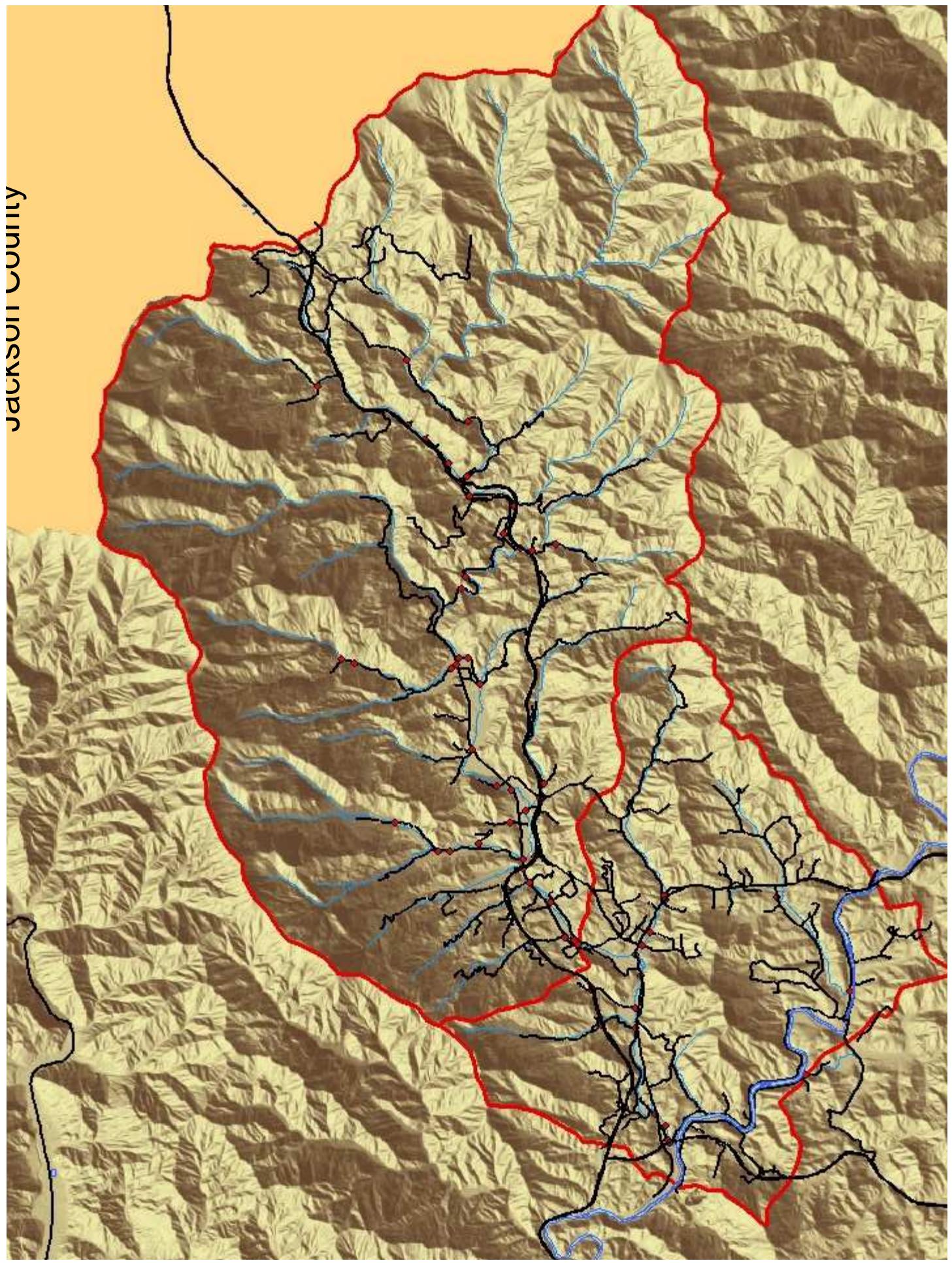
© 2007

© 2008 Europa Technologies  
© 2008 Tele Atlas

Streaming [|||||] 100%

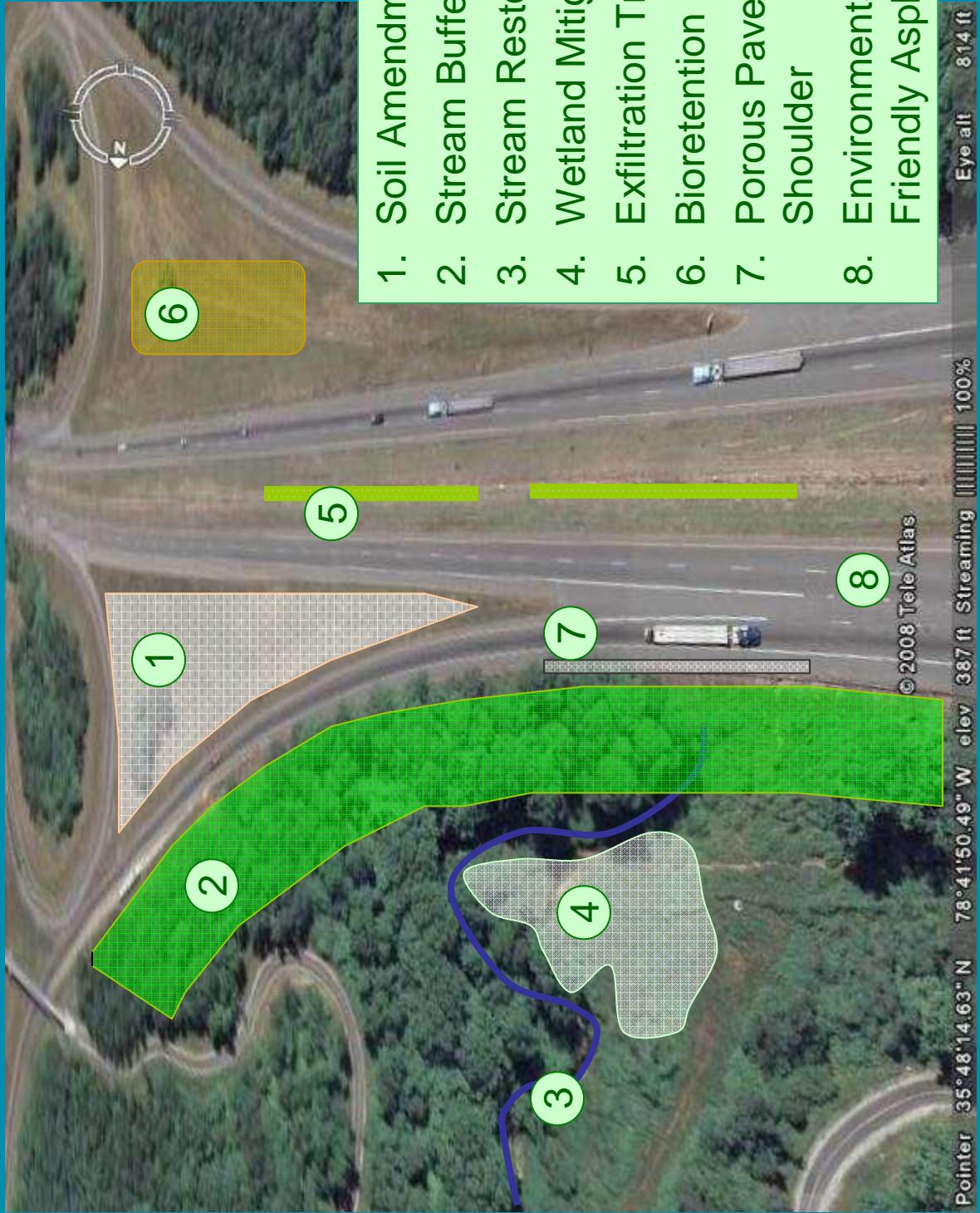
Pointer 35°51'46.62"N 78°52'22.28"W elev 287ft





JACKSON COUNTY

## North Carolina Green Highways Concepts

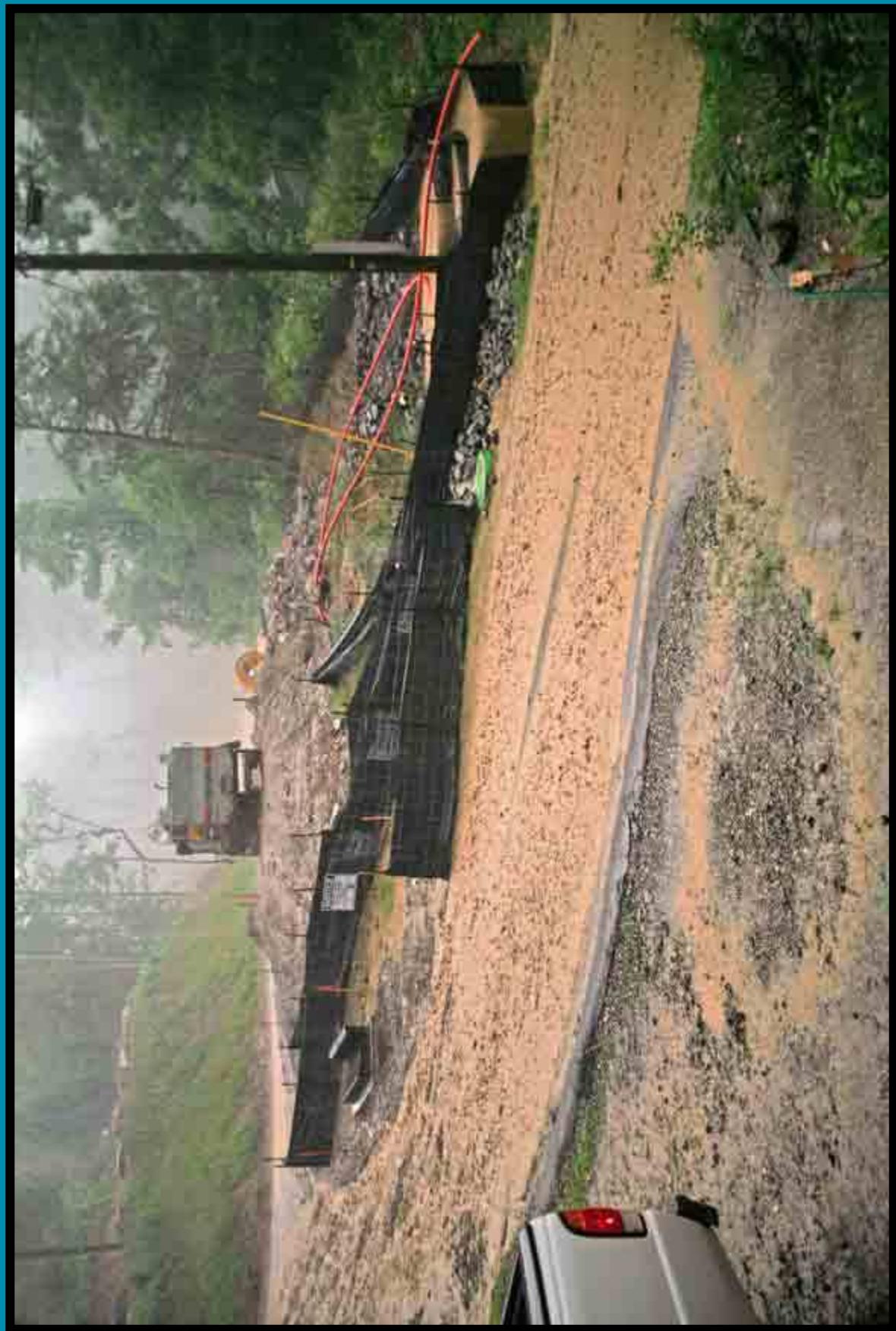


# NC River Keeper Program



[www.muddyriverwatch.org](http://www.muddyriverwatch.org)





Thank You